AMERICAN

JOURNAL OF PHOTOGRAPHY.

Published by THOS. H. McCOLLIN & CO.

VOL. 9. PHILADELPHIA, MAY, 1888. NO. 5

Edited by JOHN BARTLETT.

TIMING PLATES.

WE might well be accused of uttering a truism if we were to say that people in general imagine photography to be a process entirely mechanical in its nature. This idea, wrong as it is, seems never to have been fairly dislodged from the public mind. As the years have rolled on, and the art of photography becomes better understood and more widely practised, this misconception of which we speak has assumed a new and peculiar form. In fact, it would seem that photographic processes only need "scientific" treatment, "scientific" phraseology and "scientific" methods of ratiocination throughout, in order to yield unlimited quantities of first-class results.

If there is any truth in the saying that a fellow-feeling makes us wondrous kind, we can heartily appreciate the disappointment of those who make repeated failures in photography from the one cause of wrong exposure of the plate. If we were even to hint at the paramount importance of correct exposure, we should be again laughed at for uttering the rather unctuous truism. But we think that wrongly-exposed plates are not altogether things of the past.

Very ingenious attempts to reduce the time of exposure to rule have been made, and much space in the journals devoted to the art is filled up with these standards of comparative exposures, and tables calculated to this end. Far be it from us to throw cold water upon anything which promises to assist us in bringing exactitude into our work, but we have as yet failed to recognize the use of these abstruse calculations. If we were always engaged in photographing given objects with a given light, unvarying in power and quality, and with lenses and chemicals of given rapidity, our work would be simple enough, and the tables might be useful. Then we would appreciate the value of these elaborate exposure tables, and we could reduce the timing of our plates to the same certainty that we have in the calculation of the amounts of haloid salts and nitrate of silver required in the preparation of an emulsion. It stands to reason, however, that this can not be done, and the attempts made to systematize exposures in photography not only do not fulfil their purpose, but are really worthy of condemnation, serving as they do to confuse the operator, to weary and disgust him with troublesome calculations, and to damp his enthusiasm by inducing failures, where he would otherwise have had a fair chance of success. In one of these "exposure tables" now before us, we find sea and sky, woods and badly-lighted river banks, portraits near a window (interior), copying, etc., etc., tabulated with lights ranging from full sun to very dull and gloomy! The numbers intended to represent

exposure run from ¼ to 100. This table is to be used in connection with a number of others, in which numbers are given for the different months of the year, and schedules of lenses and stops.

Now, the very point where the skill of the accomplished landscape photographer is shown, is that by long practice his eye becomes so trained to the variations in the color of objects, and to the light in which he sees and photographs them, that he rarely makes a mistake in timing the plate. Nay, more, an experienced man will be able to form a tolerably correct judgment of the exposure required by simply throwing the cloth over his head and looking at the image on the ground glass. That this seeming impossibility is really attainable by observant practice is sufficiently attested by all photographers who have had a large experience in landscape photography, and is only another proof of the wonderful degree to which our human faculties can be trained and developed.

An eminent manufacturer of dry plates complained to us the other day that he was simply deluged with letters asking questions about exposure, and betraying the fact that purchasers of plates, in many cases, believed that rules for timing could be given with the same accuracy and ease as a formula for development. We then asked the question whether correct exposure of the plate was any less important at the present day than it was during the old days of collodion, and, quite as we expected, received the answer that it was not. Those of our readers whose acquaintance with the art dates only from the days of gelatine may be interested to know that the chief reproach against the old-fashioned dry plates was that there could be no certainty in the timing, inasmuch as the development had to be deferred until the return home. When the dark tent and all the other appliances were taken into the field and the picture finished on the spot, mistakes in exposure could be easily rectified by taking another picture, but even the most skilled dry-plate workers had to confess to an occasional failure in timing. The plan generally adopted by the latter was to give the plate ample exposure, so as to make sure that the detail in the dark parts was impressed, and then develop carefully, adding a restrainer if necessary. The same principe holds good to-day, and the element of uncertainty in exposing is still present.

We can advise those desirous of doing good work and of making correct exposures, to try to systematize their manipulations so far as possible. Let them, for instance, when buying plates, lay in a large stock of one particular brand. If, say, three lenses are used for out-door work, let them find what stops will give good definition out to the edges of the plate, and then use these and no others, save when the full power of the lenses is desired for instantaneous effects. In the earlier attempts, at least, let a full record be kept in the note-book of the light, whether full sun or diffused, and of its color, whether yellow or white, of the approximate amount of cloud present in the sky, and of the color of the subject, together with the amount of shadow it presents, and of the time of day at which the plate was exposed. When failures occur in the timing, do not throw the plate away until it has been carefully studied in connection with the record, a comparison made with other plates, and some attempt made to see how and why the failure has taken place. By pursuing such a course, the habit of observing natural landscape with special reference to exposure will form of itself, and the operator will soon begin to feel the pleasure arising from his increasing possession of a quick and accurate eye and judgment.

ELLERSLIE WALLACE.

NOTES.

PHOTOGRAPHING ANIMALS WITH FLASH LIGHT.—There is no branch of our art which requires greater skill or the exercise of more patience and good temper, than the photographing of animals in natural and pleasing attitudes.

Under the sky-light puss and pug are always shy, suspicious and disagreeable, and the average operator undertakes the task only to accommodate a good customer, and would fain decline if good opportunity should offer itself. At home with ordinary room illumination the feat is out of the question. It is just in this province that the new illuminator, the magnesium flash light, comes in to our relief, making the performance a real pleasure.

The animals are perfectly at home and are on their best behavior. A sociability at once springs up between them and the operator, and they really seem to enjoy the occasion. The very short exposure necessary, combined with the intensity of the light, enables one to obtain the animals in those positions in which celebrated painters delineate them.

We have but recently tried the light upon animal pictures; but the excellent results, and, above all, the wonderful expression in the faces of the creatures, encourage us to continue. Not only dogs and cats, but rabbits, guinea pigs, domestic fowls, etc., can be grouped to form charming pictures. We recommend this new departure to the amateur, whose leisure and artistic taste we are sure will yield beautiful results.

The gas light should be left burning in the room, or, if the operation is performed by day, the shutters need not be closed.

The animals do not mind the flash, unless the powder is ignited in total darkness. The transition is apt to frighten them. A single charge of Blitz-pulver is ordinarily sufficient, but if the picture requires stopping down of lens, when several animals are taken in a group, more powder should be used.

DEVELOPMENT OF BLITZ-PULVER NEGATIVES.—To secure the desired artistic effect in the development of magnesium Blitz-pulver negatives, a developer must be used to give rich gradation of tones, softness in the high lights, and depth with detail in the shadows. All harshness or violent contrast must be avoided, consequently the amount of pyro must be reduced to the minimum, all direct application of bromide of potassium avoided, and a liberal quantity of water made use of.

We have found the following formulæ to work admirably, giving a rich grey-toned negative, with excellent printing qualities.

Make the following stock solutions.

A		B	
Water,	12 oz.	Water,	12 oz.
Sulphite Soda,	2 oz.	Sulphite Soda,	2 oz.
Citric Acid,	60 grs.	Carbonate Potassa,	3 oz.
Bromide Ammonium,	20 grs.		
Pyrogallic Acid,	1 oz.		

For development, take of A, 1½ drs.; and of B, 3 drs.; water, 8 ozs.

It will be seen that this developer contains an excess of alkali. Our employment of this large proportion of alkali is not to force up the development because of any undertiming of the plate, but it is used in connection with the excess of water to se-

cure softness in the negative. After all the detail has appeared, continue the development for intensity. Should the plate be slow in gaining strength, add to the developer 1 drachm of pyro, and continue until proper strength is secured.

Rinse off the plate, and place it in a solution of chrome alum (1 oz. to pint of water) for a few minutes, then rinse off and put in the hypo.

The object of the alum is to clear the negative from pyro stain, harden the film, and obviate long washing after development.

STILL-LIFE SUBJECTS.—The magnesium flash-light can also be employed in taking still-life subjects, fruit and flower pieces. There are no violent reflections from the polished surfaces, and the shadows are soft and pleasing, moreover many effects can be secured impossible with long exposures, as, for instance, steam arising from vessels, etc. To counterfeit vapor a few burning pastiles should be placed in the bottom of the bowl, the smoke, if allowed to rise against a proper colored background, will come out beautifully in the negative. A candle, either lit or just extinguished, with the curling smoke looks very pretty and novel in a photograph. If it is desired to have a lighted candle in the picture the cap should be kept on the lens until the last moment before exposure. Many other kindred devices will suggest themselves to the photographer.

THE above is a cut of the medals offered by the Minneapolis Convention, July 10th to 13th, inclusive. They are to be of gold, silver and bronze. The obverse side is left plain for the recipient's name. "The *metal* waiteth" for the fortunate ones.

We have not yet received official notice of the prizes, but are asked to make known the offer of our publishers—a prize of $50.00 in gold for the best set of pictures made with McCollin & Co.'s magnesium Blitz-pulver. We hope this will induce many to compete, not merely to win the prize, which only one can obtain, but to test the virtues and values of the new illuminator in photography.

MODIFICATION OF THE MERCURY INTENSIFIER.—At the last meeting of the Photographic Society of Philadelphia a new method was given by Mr. John Bartlett

for intensifying gelatine plates with mercury, which offers peculiar advantages over the old plan.

The negative to be intensified is first placed in a bath consisting of per-chloride of iron, citric acid, water; the object of which is to clear up the shadows and to remove any trace of fog, which, if allowed to remain, would go on intensifying with the rest of the image, and the last stage of the plate would be worse than the first. After a few minutes, the plate is removed (the iron and citric acid is in reality a powerful reducer, and care should be taken not to allow the plate to become too thin), washed under the tap, and placed in the bi-chloride of mercury solution (usual strength) until the film is bleached, and again washed, and then subjected to the weak bath of ammonia and water until blackened. Should the intensification be carried too far, as is frequently the case, the negative can be brought to any desired degree simply by replacing it in the per-chloride of iron and citric acid until the half tones are restored. The resultant negative is excellent in printing qualities.

CHLOROPHYL AND GELATINE BROMIDE PLATES.—AT the April meeting of the Franklin Institute, Mr. F. E. Ives announced that he had succeeded in securing the full effect of chlorophyl upon gelatine bromide plates, and showed photographs of the solar spectrum upon such plates in comparison with the same or commercial "orthochromatic" plates. The total color-sensitiveness of the chlorophyl plates was greater than that of the commercial plate, and was pretty evenly distributed throughout the yellow-green, yellow, orange and red, down to the Fraunhofer line *a*; but the blue sensitiveness was so great as to make it necessary to use a deep orange een in photographing paintings, etc. The chlorophyl solution was two years old. The plates were prepared by flowing with the chlorophyl solution, then drying, then washing for about five minutes, after which they were either used at once or first allowed to dry. It was stated that the drying and subsequent washing or soaking was essential to the production of strong color-sensitiveness.

BLITZ-PULVER FERROTYPES.—WE translate in our present number an amusing and practical paper by Dr. Vogel on Theory and Practice.

The doctor complains of the conservativeness of his country, and noting in particular the apathy in not perceiving the benefits to be obtained from the magnesium flash-light, contrasting the Germans' reception of the new illuminator with the welcome the English and Americans gave its advent.

We cannot speak definitely of the popularity of the flash-light with English professionals, but must reluctantly acknowledge that our professional photographers have not awakened to the value of the new force in their hands, evidently regarding it as a toy for the amateur, forgetting the big mistake they made in their estimate of the dry plate on its advent.

However, one would imagine that instead of wearying the public with their perpetual cry about bad times and cut-throat prices, some of the more enterprising would just try the effect of the new light in drumming up trade. The summer season is coming in when the ferrotyper reaps his harvest. Why should not the ferrotyper at the sea-side draw into his studio a part of the mighty human tide which surges along the beach at night. The mere novelty of the thing would attract.

It is possible to make a ferrotype plate rapid enough for a flash-light picture by proper regulation of the bath and developer; besides the power of the powder could be greatly augmented if necessary by a little ingenuity in illumination. The truth is an amateur ferrotypist has shown us some very good results. Surely a skilled operator could make the experiment pay—at least the expense is trifling, no skylight or curtain being necessary. Let the sea-side photographer give it a trial.

THE ACCURATE MEASUREMENT OF PHOTOGRAPHIC EXPOSURES OF SHORT DURATION.

Read at the Meeting of the Philadelphia Amateur Photographic Club.

IT is becoming the custom to distinguish photographic exposures by the terms *time* and *instantaneous*, as if the so-called instantaneous exposures are made in no time or in such a short interval of time as to be impossible of measurement.

The expression "*Cap-off-and-on*" is also used to designate a short so-called time exposure, and may be made to mean any exposure from one-fourth to one-half or even two-thirds of a second, according to the deliberation with which the operation is performed.

The word "*time*" is apparently used to indicate an exposure made by hand—by cap or bulb—the duration of which is under the will of the operator, in contra-distinction to the term *instantaneous*, which simply conveys the somewhat meagre information that the exposure is made by a mechanical device set in motion by the will of the operator to uncover the lens, but closing it automatically.

"*Instantaneous*" is an indefinite term, *a* somewhat elastic expression, sometimes conveniently used for indicating exposures made by Hand, of a quarter *of a* second or less duration.

It will readily be granted that a mechanically made exposure is capable of repetition with much greater precision than any hand exposure of less than five seconds.

Again, would it not be much more convenient, for the purposes of classification, comparison and discussion, if the mechanical means of exposure were accurately rated, than the custom of having recourse to such slip-shod terms as "*instantaneous*," "*cap-off-and-on*," as a means of conveying definite information.

I do not say such terms should never be used, but that they should be used only in the absence of a more exact terminology, or when definiteness of expression in terms would be out of place or pedantic.

If a photographer were asked what exposure a certain negative had received and how much pyro, etc., was used in its development, and he should answer, "The exposure was instantaneous, and a good dose of hyro was used in development," what ought we to understand? Simply that the exposure had been made by mechanical means, and probably in a duration of time between the one-thousandth and one-fourth of a second, and that four to ten grains of hyro to one oz. of water had been used in making up the developer.

But suppose the answer should be exposure one-twelfth of a second diaphragm *f*—19, plate Carbutt's Eclipse, pyro 5 grains to ounce, would not the information by its definiteness be more valuable?

If photography be an art science, let those who practice it, no matter whether as a means of livelihood or as a pleasant recreation, aim at scientific precision.

We have instruments for measuring the sensitiveness of plates with more or less exactitude, and it seems equally desirable to be able to determine the rapidity of instantaneous shutters or *exposers* (which is perhaps a better name), so that it may be known how close we dare sail to the wind with a given diaphragm, subject and plate. Instantaneous photography will then cease to be the uncertain and difficult task which many suppose it to be.

A lens exposer which has not been rated may be compared to a rifle without an adjustable sight.

Several methods have been proposed for the purpose of determining the duration of the exposure of mechanical exposers. Some are applicable only to certain forms of exposers. Gravity-drop exposers may be calculated (if we ignore the retarding effect due to friction) in accordance with the known rate of acceleration of falling bodies, but when used with a rubber band or spring it is beyond any known rule of calculation. There are also two tuning-fork methods, one may be called the graphic, and the other the photographic method. The first consists of a tuning-fork of suitable pitch to give a convenient number of vibrations per second. A delicate stylus is attached to one arm of the fork, which is so adjusted as to trace a zig-zag line on the moving shutter of the exposer. This method is simple, but obviously not applicable to many exposers, and is, in common with the photographic tuning-fork method, quite inadequate to measure the time of that class of exposers made on the "go and come" or return principle, because at the most important part of the exposure (the moment of rest) it fails to record.

No photograph of an object in motion can be as sharp as the same object at rest. Perceptible or imperceptible, it must be more or less of a blur. Let an object be photographed having a motion of known speed, and the blur in the photograph will be a more or less accurate gauge of the duration of the exposure. A horse going at a certain gait, the fall of a white tennis ball in front of a graduated rod, are instances of inaccurate measurements, because, although the rate of the tennis ball or horse be exactly known, the blur is not all photographed. This method is, therefore, perhaps nearly as accurate as Captain Cuttle's watch, "which, when put back half an hour in the morning, and about another quarter toward the afternoon, was a watch that would do you credit."

You will please remember that the percentage which the movement in the photograph bears to the total movement depends both on the intensity of the light reflected from the object in motion and the blackness of the background. The sensitiveness of the plate and rapidity of the lens are also factors in the question. Take an extreme case. A gray or dark moving object, say a cricket ball, is photographed in a dull light, with a slow plate, a slow lens and a very short exposure: result, no blur, or even trace of the moving object. Now photograph your white tennis ball, falling in bright diffused light, with a landscape lens, and fully one-half of the movement is not photographed, and part of what is photographed is probably fogged out by light reflected from the background. These are points often overlooked, and will tend to make the exposure appear shorter than it is in reality.

Now substitute a solid metal ball, nickel-plated and highly polished, let it fall in bright sunlight in front of a black velvet background set back in a dark recess, with lines of white string stretched at measured distances apart across the front of the

recess; use a very sensitive plate and a rapid portrait lens, and having a moving image of the sun, your photograph will show the total movement.

When you read of exposers which are said to work in the one-five thousandth part of a second, or less, it will be well to take it (if at all) with the customary grain of salt, and remember Captain Cuttle's watch. But I shall have more to say on the practical limits of rapidity when I take up the subject of Exposer Construction.

Another proposal is to use a pendulum as a moving object. The same objection applies to it as to the falling ball, *i. e.* the motion is irregular, involving complicated calculation.

The photographic tuning-fork apparatus is much more complicated: in fact you get at the result in a most indirect and round-about manner. A small mirror takes the place of the stylus on the arm of the tuning fork, and a heliostat is used in order to keep the sun image on the small mirror, which reflects a vibrating image unto a sensitive film attached to the moving shutter of the exposer to be tested. Having all this, the rate of vibration of the tuning fork has to be ascertained, because, being weighted, its normal action is interfered with; the heliostat could be dispensed with by using a small convex mirror on the tuning fork, which would simplify it somewhat, but there are other methods far less elaborate, and applicable to all exposers.

A circular motion has none of these objections, and also helps a rapid lens in giving good definition in every part of its course.

The apparatus I prefer, and have used for over six years, consists of a clock movement by weight (or a coiled spring could perhaps be used); in the latter case it should have a fusee motion. The pendulum is removed, and a mandrel takes the place of the minute hand to receive the revolving disc, which is 18 inches in diameter. It is covered with black velvet, and has a small convex mirror mounted near its margin. The train of wheels connected with the striking part of the clock is with its fan made to do duty as a regulator, then the toothed wheel connecting the hour hand is made to do duty as a tell-tale, so that every seventy-seven revolutions of the disc a click is heard, which is useful in adjusting the weight to produce the right speed; from one revolution in two seconds to three revolutions per second is found to answer all purposes. A measuring plate is made by photographing a graduated circle, and making a transparency therefrom.

It is only necessary to lay it on the negative to be measured, and the distance traversed by the revolving disc during exposure is seen at a glance and measured accurately without any intricate calculations, and is, furthermore, applicable to any exposer whatever. I shall now show some slides to illustrate the apparatus and its work.

CHARLES TRUSCOTT.

THE ORIGIN AND TECHNOLOGY OF PHOTOGRAPHIC CHEMICALS.

Thirteenth Paper.—Ethers.

AS ether is one of the typically "organic" chemicals, a few words to elucidate organic and anorganic chemicals will not be amiss at this time.

Organic chemistry was supposed to relate to the composition of vegetable and animal substances, and therefore distinguished from the chemistry of minerals or anorganic bodies. As the minerals found in nature give an immense number of new

chemical compounds, so organic substances give innumerable new bodies by chemical action which show similarity to the chemical composition of the original organic material. Organic chemistry, therefore, consists in the elucidation of the products of chemical reactions on organic substances, and it is determined that in nature the most complicated animal and plant substances are reached in an unbroken path from simple organic components, in which every step has a certain relation to the preceding one. Therefore a pronounced difference between the chemical properties of organic and anorganic bodies does not exist in the theoretical chemical consistence. All organic bodies contain carbon among their constituents, therefore organic chemistry can be called the chemistry of compounds of carbon, except in cases where the bodies show no similarity to organic bodies, as in substances formed simply of carbon and the metals. In organic substances the carbon is not directly combined with other elements and cannot be substituted by other elements, where, for example in the metallic bodies, one metal can be replaced by another, as in electro-plating, etc. But it is easy to convert the carbon with some of the other compounds of an organic body into another organic substance. Such determined carbon compounds which, either by double decomposition or by replacement, form new bodies, are called the organic radicals, and therefore organic chemistry can be properly called the chemistry of the compound radicals of carbon-containing bodies.

These radicals present, in their properties of combination as simple radicals, great resemblance to those of the anorganic elements. Thus potassium combines with oxygen to form potassa, with chlorine to form chloride of potassium, and these can again combine with many others to form most complicated bodies. In organic substances exactly the same properties of combination exist. For an instance, the organic radical $C_4 H_5$ called ethyl can give entirely similar bodies in combination as potassium does:

KO—Potash	Ethyl +O—Ethyloxide, or ether
Kcl—Chloride of potasium	" +Cl—Chloride of ethyl
KI—Iodide of potasium	" +I—Iodide of ethel
KS—Sulphide of potassium	" +S—Sulphide of ethyl
KO, HO—Hydrate of potash	" +O, HO—Ethyloxide hydrate

and these combinations can go on to an indefinite degree. Organic bodies contain always carbon; most of them also have hydrogen, and many of them oxygen, but few of them have only nitrogen and carbon. Many organic bodies consist of carbon, hydrogen, nitrogen, oxygen, and sulphur and chlorine, bromine, iodine, fluorine, phosphorus, selenium, tellurium, arsenic, zinc, bismuth, mercury, etc., can be substituted, and it is believed that any one of the "elements" can be joined to an organic compound. As each day sees additions of new organic compounds to the list of valuable photographic reagents, no doubt some descriptions of them will be interesting, as well as the many so familiar already, as ether, alcohol, pyrogallic acid, gelatine, and many others. These bodies have all a distinctly chemical composition, as distinguished from hodge-podge mixtures, and a spare moment will not be begrudged to get an inkling of what their true inwardness is.

Coming back to our radicals, alcohol is hydrated ethyloxide, while ether is ethyloxide, and alcohol is changed into ether by rather complicated reactions by the abstraction of water. This occurs when alcohol is warmed with sulphuric or phosphoric

acids and other substances. Generally ether can be made by warming alcohol with one-and-a-half parts of concentrated sulphuric acid. The reaction which results is, however, not so simple as one would imagine from the above description, but, when the distillation commences, a certain quantity of water goes over, and if alcohol is slowly dropped into the retort an immense quantity of it can be converted into ether with the original quantity of sulphuric acid! and nearly even quantities of alcohol and ether distil over. This action was supposed formerly to be effected by catalytic action (a sort of lucus non lucendo) but now this is understood thoroughly. By the admixture of the alcohol and sulphuric acid with heat, 2 equivalents of water are taken up, and ether sulphuric acid is formed. This is decomposed at 140° Centigrade, when mixed with fresh alcohol, into sulphuric acid and ether, and thus the reaction goes on continuously, first ether sulphuric acid forming, and then this by addition of alcohol is converted into sulphuric acid and ether, and though water and ether are mixed in the distillate, yet in the retort two different reactions occur, always regularly following each other.

So in manufacturing ether on a large scale the same method is observed, except that strong alcohol is used in place of absolute alcohol, which was theoretically instanced. The distillate is gathered and then mixed with milk of lime to neutralize any free acid, and then distilled with substances to extract any free water. Ether when pure is a penetrating odorous, water white, very light liquid with a specific gravity of 0.736 at 32° Fahr., boils at 95° Fahr.

But there are many ethers generated by action of different acids on alcohol, and their composition varies accordingly. Sometimes these acids act simply as chemical agents to set up the reactions, while in the others the acid enters into combination, forming thus nitrous ether, and in others muriatic ether and acetic ethers. These are peculiar fragrant, sweetish, volatile and inflammable substances, and from their extreme inflammability should never be decanted near a flame, and should be kept in tightly stopped bottles to avoid loss by evaporation, and kept in cool places.

The sulphuric ether of the pharmacopeia contains about 25 per cent. of 88 per cent. alcohol, and stronger ether of trade generally contains a small percentage of alcohol. When kept too long it undergoes decomposition and is partly converted into acetic acid. It dissolves iodine and bromine freely, also to a certain extent taking up corrosive sublimate, readily dissolves volatile and fixed oils, many resins and balsams, tannic acid, caoutchouc and gun cotton (when mixed with alcohol).

The principal use of ether in photography is naturally for the formation of collodion for making wet plates and for making film paper. The use of ether in the dark room must be carried on carefully, and great efforts should be used to have proper ventilation and well protected lamps. As the use of dry plates in photography has made the art so much more simple, naturally the consumption of ether for collodion has been greatly modified, though all concede the superiority of wet plate negatives and slides over gelatine. This brief condensation must be accepted for what it is worth, being a very concise attempt to explain a complicated subject, and for laymen only.

FRANK S. ROSENGARTEN.

DON'T fail to attend the Minneapolis Convention of the P. A. of America, July 10–14 inclusive.

THE PHOTOGRAPHIC SOCIETY OF PHILADELPHIA.

A STATED meeting of the Society was held Wednesday evening, May 2d, 1888, with the President, Mr. Frederic Graff, in the chair.

Attention was called by the President to an exhibition of the work of members which it was proposed to hold from May 23d to June 2d, inclusive. From the pictures exhibited, and entered for such competition, the presentation pictures for 1888 would be selected.

The committee on membership reported the election of the following active members: WILLIAM T. ELLIOTT, THEODORE N. ELY, WILLIAM J. WALTON, GEORGE W. ENNIS, WILLIAM S. VAUX, JR., H. PARKER ROLFE, and WHITNEY BOSBYSHELL.

At the suggestion of the Society's representative in the American Lantern Slide Interchange, the action in regard to the report of the recent conference of delegates was on motion of Mr. Burroughs reconsidered.

Mr. Burroughs then moved that in order to facilitate the organization of the Interchange, the report as originally presented be ratified by this Society. Carried.

The President read a note from Mr. F. de B. Richards, presenting a number of books on photography to the Society, which were acknowledged with thanks.

Mr. Frederick E. Ives made the following communication:

"At a recent meeting of the Franklin Institute, I announced the successful application of chlorophyl to gelatine bromide dry plates, in the following manner: Rapid commercial plates were flowed with suitable alcoholic solution of chlorophyl, then dried, then soaked in water. The plates prepared in this manner, and then dried, are more color-sensitive than commercial orthochromatic plates, besides having relatively sufficient red sensitiveness; but owing to excessive blue-sensitiveness, should be used with a deep orange color screen. The successful application of chlorophyl in this manner suggested a trial of other color-sensitizers in the same way. The result was a great surprise. Rapid commercial gelatine bromide plates flowed with alcoholic solution of erythrosine, then dried, then washed or soaked in water, proved to be ten or fifteen times more color-sensitive than commercial orthochromatic plates. They work clear and bright, and quick enough for portrait work with the yellow screen."

Mr. Rosengarten showed some samples of chemicals which had recently come into notice for photographic purposes. They consisted of meta-sulphite of potash, bi-sulphite of potash, hydroquinone, and muriate of hydroxylamine.

Dr. Mitchell stated that he had obtained excellent results with hydroxylamine in combination with pyro-gallic acid, as a developer for lantern slides. The developer kept perfectly clear during development of 12 slides, and then was but slightly tinged with yellow. The color of slides was a rich purplish black with clear shadows. The formula was one recommended recently by Mr. Cassebaum.

Mr. Bartlett had also employed with the best results the formula of Mr. Cassebaum, in using hydroxylamine and pyro for window transparencies, and could recommend it for giving fine tones and good printing qualities to negatives. He had used the same solution upon a number of plates without observing any muddiness.

He had hoped it would be advantageous in developing bromide prints, but was not fortunate in his results, the paper becoming stained and clouded in the whites. He deprecated the use of hydroxylamine alone in connection with alkalies as a developer, and spoke of the injury it caused by reticulating the film.

Mr. Rosengarten moved that a committee be appointed to experiment with the new developers coming into notice, and to give a demonstration before the Society, at such time as may be convenient. Dr. Mitchell and Mr. Bartlett, with Mr. Cassebaum, by invitation, were appointed a committee for this purpose.

Mr. George Vaux asked if the salts of quinine had ever been successfully used in development.

Mr. Tatham stated that a large proportion of acid was necessary to dissolve the quinine, and the addition of the alkali made the mixture turbid.

Mr. Bartlett called attention to his experience in intensifying gelatine plates with bi-chloride of mercury, followed by ammonia, which he thought would be of practical value, on account of the capability it afforded of controlling the degree of strength. He said that with the method usually pursued, one was obliged to take whatever degree of intensity the mercury would give, and that frequently the negative was made entirely too dense for printing purposes, and gave harsh results with chalky high lights.

The method he follows is to first immerse the flat overtimed negative in a bath composed of,

Per Chloride of Iron (cryst.)	120 grs.
Citric Acid, ...	240 grs.
Water, ...	32 ozs.

the object of which is to thoroughly clear up the shadows, and to remove any slight trace of fog, which, if allowed to remain, would increase only with the intensification, and injure the brilliancy of its result.

The negative is allowed to remain only a few minutes in this bath, which is, in reality, a powerful reducer, and would, if the action upon the plate were long continued, obliterate the image. On removal, the negative is washed under a tap, then transferred to the bi-chloride of mercury solution, which may be of any strength from 10 per cent. up to saturation, a little chloride of ammonium being added if necessary to facilitate solution. After the film is well bleached, it is again washed, and placed in ammonia and water (1 dr. to 2 or 3 ozs.)

The negative should be allowed to gain all the strength possible, no matter how dense, even to the appearance of cast iron, inasmuch as the means of reduction to any desired degree of strength are completely under control.

All that is necessary is to re-immerse the negative in the solution of per chloride of iron and citric acid, as given above, and to watch until the gradations of light and shade are properly represented upon the plate.

The resultant negative is harmonious in tone and of excellent printing qualities, and also keeps well. Mr. Bartlett thought that the preliminary bath of iron tends to destroy the last traces of hypo in the film and thus prevents staining when the mercury is applied. He believed that the philosophy of intensification consists in first clearing up the film before application of the strengthener, and that whatever method of intensification is employed the per chloride of iron solution will be found a most excellent clearer, he having first recommended it more than a year ago in connection with Mr. Cassebaum's gallic acid and silver intensifier.

In regard to permanence of intensified plates, Mr. Bell claimed that mercury followed with ammonia, mercury followed with cyanide of silver, mercury followed with bromide of potassium or sulphite of sodium, are permanent; but plates strengthened

with iodide of mercury in any form are fugitive, and it should be used only when the negative is not to be preserved and great contrast is required.

Mr. Truscott (a visitor) said his experience was opposed to this, as he had no trouble with iodide of mercury on that score, and although the image so intensified was liable to turn yellow (especially if the action of the mercury was very complete), even during the washing, it was quickly restored and rendered permanent by a momentary dip in the fixing bath, or a more prolonged immersion in a very dilute solution of hypo. He stated that his experience with mercury and ammonia was more especially in connection with the toning of collodion transfers and opals, in which case, although it gave very fine brilliant tones, all the beauty faded out during drying, especially if hastened by heat. One advantage of iodide of mercury was its being a one-solution method, allowing every facility for watching the progress of the process. He thought that more permanency was to be expected by whitening the image with mercury chloride, and after washing, blackening with dilute hypo or sulphite of soda, than from any other form of mercurial intensification.

Mr. Bartlett substantiated Mr. Bell's remarks that the method advocated by Mr. Truscott would cause the entire destruction of the plate. He had some time ago made experiments with a view of obtaining a warm brown tone upon gelatine lantern slides, and had employed for the purpose mercury as a toner before fixing, followed by a dip in the hypo solution. The image bleached out by the mercury was reproduced by the mercury in a beautiful brown tone, quite to his taste, but, unfortunately, it was very fugitive, the whole slide fading out in a day or two when exposed to the diffused daylight.

Mr. Browne stated that he had doubts as to the permanency of gelatine plates after being strengthened with mercury bi-chloride, mentioning many cases where positives and negatives had been seriously injured or destroyed by using this chemical with after application of ammonia. Even a final treatment with hypo had not, in his hands, been satisfactory.

The results of intensifying with mercury, and after treatment with silver cyanide, yielded some lasting negatives, but the action of these chemicals was so vigorous that the high lights were inclined to be too strong.

Mr. Browne mentioned that in looking over a number of gelatine positives made several years ago (all of them having been treated with mercury and ammonia), the pictures had almost faded from view. Thinking that possibly a second application of the same chemical might repair the damage, the process was repeated and proved successful; showing that positives or negatives which appear to be utterly worthless can be rescued, at least for the purpose of reproduction. Of course every photographer of experience is aware that it is useless to apply mercury bi-chloride to a gelatine plate unless it has been thoroughly washed to remove the hypo-sulphite of soda. In the case of the fading gelatine positives mentioned, Mr. Browne was not prepared to say that all the hypo had been removed. But in other experiments especial care had been taken to remove that objectionable chemical. A few trials seemed to point to platinum bi-chloride as an intensifying agent for gelatine plates.

The discussion turning to the subject of quick *vs.* slow plates, Dr. Mitchell favored the former for landscape work, particularly for foliage in shaded places, where long exposure would be necessary with slow plates.

Mr. Bartlett thought that the objection of Dr. Mitchell to the use of slow plates

for landscape work because of the motion of the foliage was rather more applicable to very rapid plates. He thought that the slow plate, by reason of its diminished sensitiveness, was less liable to translate upon the film any slight motion of the foliage than a rapid one: that a very rapid plate would register impression whichs would not be perceptible upon a slow plate.

In this connection Mr. Bell remarked that Dr. Mitchell's objection would hold good only when a shutter was used; if it were time exposure the movement would be registered upon the plate more than if a slow plate was used, as then the foliage could be watched and the lens covered with a cap, and exposure begun again when the foliage becomes quiet. "There is not in the market a slow enough plate for this mode of working on a windy day. A plate requiring thirty seconds to one minute exposure would be what I recommend, collodio bromide."

Dr. C. L. Mitchell remarked that in comparing the merits of slow and rapid plates he was inclined to give preference to a quick plate, particularly in photographing woodland scenery. On the latter a long exposure was nearly always required; in fact, a plate could hardly be over-exposed, and if a slow plate was used it was difficult to avoid the movement of the foliage, without repeatedly capping and uncapping the lens, and thus running more or less risk of blurring the outlines of the picture. With a rapid plate, on the other hand, a much shorter exposure was required, and the occasional interval of quiet during a light summer breeze generally afforded sufficient time to obtain an excellent negative.

Dr. Mitchell remarked that much of the adverse criticism which rapid plates received was due to a lack of proper handling of the plate during the process of development. The fault was not so much in exposure, for it was perfectly possible to take a plate which had been very much over-exposed, and yet obtain a good negative from it. The amateur in development was generally guided too much by the printed sheet of instructions accompanying each box of plates—take so much No. 1 and so much No. 2, mix them and flow over the plate—and proceeded to develop all his exposures according to this iron-clad formula. The result was that many of his exposures were ruined, whereas, if the development had been carefully studied, a much smaller number of failures would have resulted. In development it was well to bear in mind the cardinal principles that pyro gave density, the alkali was the accelerator and hastened action and also brought out detail, and bromide retarded action and kept the shadows clear. Then each plate should be made a separate study of, and its development conducted according to these rules. If over-exposed, the usual quantity of pyro should be used, but very little alkali to commence with, and if the action did not proceed at once, then adding cautiously more alkali, a few drops at a time, until the image began to show itself. In commencing development with a new developer, unless the plate was known to be under-exposed, it was well to add a few drops of bromide. For subsequent plates this was not necessary, as the chemical action of the developing liquid on the plate resulted in the absorption of a certain amount of bromide in the developer from the plate. For this reason with each subsequent plate the action of the developer became less rapid. Dr. M. was in the habit of saving the developer after use and keeping it in an amber glass bottle with a rubber stopper. In commencing development with a fresh developer, it was his usual custom to add to this about one-third of its bulk of the old reserved developer. The result

being a slowing of the development and a much more soft and even action of the liquid upon the plate.

Mr. Bartlett thought that development was a fine art, requiring constant practice, like music, to keep one's self in working order. He believed it required an exercise of judgment, and that the mode of development should be in accordance with the character of the subject. In his pictures of still life, where he desired harmony in preference to brilliancy and great contrast, he slightly overtimed his subject to ensure softness; then in the development, in spite of the fact of the plate being overtimed, employed an excess of alkali over the pyro, with a large proportion of water; for instance,

1 dr. of stock solution of pyro,
1½ to 2 drs. of stock solution of alkali, and
8 or 10 ozs. of water.

The plate he allowed to come up slowly until the detail fully appeared, and to then remain a reasonable time in the developer, if he found it gradually acquiring strength, but if it showed tardiness he added pyro to strengthen. He employed the same method with success in developing magnesium flash light pictures, in which it is necessary to keep down contrasts.

Mr. Carbutt volunteered a few remarks on developing instantaneous exposures. He said during the past week "he had been trying three modes of developing instantaneous exposures, using the same alkaline solution, but in varying degrees of strength. First by using it the full strength as given in formula accompanying the Eclipse plates, and published in the *Photographic Times* of March 30th. Second by following directions given in that formula for instantaneous exposures, and when detail was fully out, but yet lacking density, rinsing off, and placing in the hydrochinone developer published for use in making transparencies, leaving it in this until full density was obtained. Third, by taking 2 ozs. of the dilute soda solution, 2 drachms of No. 1, 6 drops of the bromide solution, and 8 ozs. of water; the exposed plate immersed in it, covered over, and occasionally agitated. It took one hour to fully develop the image, and the result was very satisfactory, the gradations being very finely rendered. The first method, using the concentrated soda solution on the plate, and afterwards adding to each ounce one drachm of No. 1, brings out the image in about the same time as a fully exposed plate, but the deposit is very coarse and lacks the delicacy of the slower method.

For instantaneous exposures at the seashore, Mr. Carbutt believed most photographers used too rapid a plate, and he further remarked that orthochromatic plates would give better results for such work than plain bromide plates; also in developing time exposures, better results will be secured when using a fairly rapid plate, by diluting the alkali solution, and using bromide in the developer, bringing out the image slowly.

Mr. Clemons (visitor) showed a number of fine silver prints on plain paper, prepared by a new process. Both wet and dry plates were used in making the prints (portraits), Mr. Clemons preferring the results from wet plates as having less tendency to flatness. The details in both high lights and shadows, together with the intermediate graduations, were beautifully rendered.

The Secretary showed a convenient device for use in the dark room in cutting plates in half. It consisted of a thin board about 7x8 inches, on one side of which

a strip of wood was attached $4\frac{5}{16}$ inches from one edge. To cut a 4x4 plate in half, it is laid with one end close to the edge of a table or other suitable support. The cutting board is laid on top with the strip pressing closely against edges of both plate and table. This will bring the edge of the board in proper position for use as a ruler to guide the diamond or glass cutter, so as to cut the plate exactly in half without necessity of measuring. Plates can be cut with utmost convenience and accuracy in absolute darkness. Other strips can be added, or the position of strips made adjustable for cutting plates of any required size.

Adjourned.

ROBERT S. REDFIELD,
Secretary.

THF METAMORPHOSES OF THE SILVER IMAGE.

Read before the Conference of the London Camera Club.

BELIEVING the best form of printing process to be one in which slow development is employed, I have been trying lately to obtain some chemical method of replacing the blacks in the gelatine bromide development process by some warmer tones. These trials have let me into an interesting set of experiments on the silver that forms the image of a bromide print, which may not be uninteresting. My first experiments were, of course, made in the direction of varying the exposure and development, but no beneficial results were obtained in this direction. Occasionally a brownish tone is produced, but the print nearly always suffers, becoming flat and mealy.

I then made some experiments in tuming the paper with hydrochloric acid, after Blanquart Evrad's process, but beyond rendering the paper very insensitive, it had no effect in altering the color of the developed image.

I then took a new line of country, and after developing and fixing the print, acted on it with several different oxidising substances, changing in this manner the nature of the haloid salts, of which the image was formed, and then developing it.

My first experiments were made by transforming the metallic image, or what for the sake of argument I will assume to be a metallic image, into a chloride of silver, or a double chloride of silver, and some other metal or base.

With this idea I treated the halves of various prints with ferric, cupric, mercuric chloride in strong solutions. The bleaching or oxidising action is very rapid in all these cases. With mercuric chloride it is very complete, not a trace of the image being left; but with the other chlorides faint, browny-yellow images always remain.

On refixing these oxidised images a further difference is noticed—whilst the mercury chlorised image reappears (a sulphide of mercury being formed), the iron and copper chlorised images disappear totally. I have had very visible images on glass plates, of which, after fixing, not a trace remained.

The image appears to be completely destroyed, as the strongest reducing agents fail to bring any trace to light.

The unfixed portions, however, are easily developed by any of the ordinary developing agents, such as alkaline pyro or ferrous oxalate. They redevelop up slowly and easily exactly to the same state that they were before being chlorised. There is no difference to be observed between the half treated with pyro and that treated with ferrous oxalate.

May I be excused if I make a slight digression here, and say that I think a very easy and reliable process of either intensification or reduction might be based on this process? I am aware that Messrs. Cosmo Burton and A. Laurie proposed and described some time back a process of intensification by means of mercuric chloride and development, and that cupric bromide has been used for the same purpose, but I am not aware that it has ever been proposed as a process of reduction.

Roughly, the process I should recommend would be as follows:—Supposing that directly after development, and before fixing, you are discontented with your development—the picture is too hard or too weak. In this case, after hardening the film with alum, and before fixing, I should chlorise it, and then, after washing well, proceed to redevelop it, taking care in this development to avoid the errors I had fallen into in my previous development. For this second development I should advise the use of ferrous oxalate; much less washing is required between the operations than when you use pyro, for, as you all know, if ferric chloride be the oxidising salt you have used, the slightest trace left of this will give ink-stains in the presence of pyro.

As far as my idea of getting different colors by chlorising and redeveloping the film was concerned, these experiments were a failure. The color of the deposit develops just the same. I tried also bromising the film with identically the same results. I further used an oxidising mixture composed of bichromate of potash and hydrochloric acid. But again the result remained unchanged. In fact, it is quite impossible to tell, from the color and appearance of the image, whether the film has been chlorised, bromised, or simply oxidised. With chromic acid, I have got a slightly different color, but the whole image had lost so in intensity that I am inclined to put it down to other causes.

My idea, therefore, of obtaining difference of color had failed.

I then proceeded to use iodine as my oxidising base, and treated fresh prints with iodide of mercury and iodine, or rather tincture of iodine diluted with iodide of potassium.

Here, for the first time, I thoroughly succeeded in altering the color of the print. When treated with mercuric iodide, and redeveloped either with pyro or oxalate, the print has a rich brown color, which to me, at least, is fairly pleasing—as to its permanency, I am afraid to say anything. I know that bromide prints bleached with mercuric chloride and treated with ammonia fade very rapidly. In one case under my notice, in two months the mounted print had all but disappeared; but whether these prints, which have been redeveloped and refixed, will also suffer, I am unable to say. I shall watch their existence with great interest.

With the tincture of iodine I had a veritable surprise. The positive print, when placed in the solution, rapidly turned into a negative. The conversion is very pretty. A dark bluish deposit settles everywhere on the white paper, whilst the silver image rapidly bleaches to the well-known grey of silver iodide.

The darkened negative image appears to be an unstable substance; it is, I presume, a compound of iodine with gelatine; iodide of mercury darkens it slightly; iodide of potassium turns it into purple and green, chromic acid blackens it; mercuric chloride bleaches it, and leaves a faint image of the original positive; on treatment with ammonia, it gives a greeny-yellow image.

The bluish negative is destroyed by hypo very rapidly, and leaves a faint yellow

positive. Dr. Vogel, I think it was, proposed a test for hypo on these grounds; in fact, the iodide of starch test is closely allied to this, in its *raison d'etre.*

Sulphurous acid destroys the blue image, but not hydrochloric; and either the pyro or ferrous oxalate developer completely removes it, leaving a very delicate lemon-yellow positive behind. Whether it would be possible to tone this image, and so get greenish colors, I am unable to say, but the change of the black deposit into the lemon-yellow image is very curious.

Of one other metamorphosis I would speak, and that is the use of the sulphantimoniate of potash, or Schlippe's salt, by means of which the image is turned into an antimoniate of silver.

The usual way to use it is in connection with mercuric iodide—Mr. Debenham's system of intensification; but I find a large gamut of tones, from brown to red-brown, can be obtained by either chlorising, bromising, or oxidising the image in any of the above-mentioned ways, and then treating with the Schlippe's salt. If the oxidation be carried on very carefully, almost a scarlet image can be obtained.

I have tried to obtain Bartolozzi red by these means, but without great success, but for future operators would point out some of the neutral chromates of the alkalies as likely to give the desired tone. Once, whilst treating a print with chromic acid, I got a bright-red deposit of chromate of silver. In fact, this metamorphosis or change of one silver salt for another might be useful in many ways. By transforming the image into a fluoride, and treatment with sulphuric acid, we might be able to form hydrofluoric acid, and so make the silver image engrave itself on the glass.

One other point I should like to mention, and that is the action of these oxidising agents on the exposed and undeveloped film. I find that they, at any rate, considerably slow the action, if they do not altogether destroy it. I have exposed a bromide paper to the light till the image became visible, and after treating it with cupric chloride, have successfully developed it. When the exposure is short or normal, I am almost inclined to believe that the image is entirely destroyed. If it is entirely destroyed, we ought to expect the first action of the oxidising agent on the developed image to bring oxidation to the developable stage, and a prolonged treatment should then in its turn destroy even this developable image. I can only say that a prolonged sojourn in the oxidising solution very considerably weakens the image, it being impossible to obtain the same vigor as when the time has been shorter. On the other hand, the image never entirely disappears—it is always more or less visible. This may certainly be due to the fact that some of the metal of the chlorising solution combines with the silver of the image, as we know mercuric chloride forms a double mercurous and argentous salt, either or both of which can be reacted on. It would be interesting to try the action of bromide or chlorine gases on the developed image, or some such agent as peroxide of hydrogen, in which case the advent of extraneous elements or compounds would be avoided.

These few experiments that I have described do no more than open up the subject, but if they will only persuade some one more competent than I to enlarge on them and deduce some facts from them, I shall feel that they have not been in vain.

LYONEL CLARK, C. E.

ON the 23d of May the Photographic Society of Philadelphia will give an exhibition of the work of the members shown at the recent Joint Exhibition at Boston.

THEORY AND PRACTICE.

(*Translated from Photographische Notizen.*)

HAVE we not heard, time out of mind, the professional photographer plead as a palliative for his ignorance, "Oh, we have no time for experimenting. A man of business ought not to squander the precious hours apportioned for gathering in the shekels in trying to find out something new under the sun."

Why, there are even men in our profession who do not take a photographic magazine, or if the enterprising publisher gratuitously thrusts it upon them, condescend to read only the advertisements.

But let us pause. Professional photography is sometimes justified of its children, and absolved from the crime of looking "askance and strangely" at the advice, so gratuitously offered. To cite a personal instance: I had a friend, a reputable professional, who was wont to spend his evenings in a convivialway, where the flow of the ruddy cup stimulates the flow of ideas. His festive companions were men of chemical lore, and their advice to their photographic friend was poured forth in profuse strains of unpremeditated volubility.

Upon a time, as our acquaintance was bewailing the persistency with which the last trace of silver salt keeps its grip, before toning, he received the consolation that the effectual means of salvation for the prints was to be found in ordinary cooking salt.

Accordingly, the next morning, *an entire ounce of salt* was doused into the washing tank, where 200 prints were disporting themselves. The result—a ruddy hue diffused itself over the fair prints, and the whole batch was suffered to run violently down a steep place into the sink.

Upon another occasion, chloride of palladium was recommended as an intensifier, whereupon an ounce of the salt was obtained (standing in business being excellent and credit good), put in a certain amount of water and flowed over a freshly exposed plate without causing a moiety of change in its condition of weakness. The intensity did not come —but the bill did later. I can assure it was strong enough to gratify the photographer—$6.40 for one ounce bi-chloride palladium, every drop of which had found an exit through the water-pipe.

There came a repetition of these experiments. That gallery has disappeared from among the studios of light; its possessor has faded from among the children of the silver beam.

Such experiences might justify the contempt of the practical man for theories, but then the theorist might contend that the possession of ordinary intelligence is presupposed.

Had the professional taken with his salt a grain of common sense, and instead of venturing the whole quantity amongst the entire fleet, tried its effect upon three or four, it is safe to say the whole batch would not have been wrecked.

It is only an excess of salt that causes an injurious effect.

One should not experiment blindly, nor should one think his business safe because, like an ostrich, he sticks his head in the sand and hides from view the rapid progress about him.

On the advent of the phototype process, I called the attention of a skilled lithographer to the value of the subject. He laughed it to scorn. He was not to be

deceived with the great worth of these novelties. In vain I urged the certain success should one enter the field possessed of the knowledge and experience he had.

He derided my idea that phototypography would push out lithography.

It was only fifteen years ago; now his establishment, once so thriving, no longer exists, and he is engaged in another business.

I could pile up examples, but what I have told will suffice. Every day demonstrates the fact that discoveries of great value are ignored, and no notice taken of their value from a money point of view. The worthless novelties which are constantly springing up distort the true worth of many a good thing, and the good with the bad we consign to the limbo of neglect.

Verily the adage has force, A prophet has not honor save in his own country. Gädicke and Miethe were the first to revive the interest in magnesium light, but it was left for the English and Americans to see the value of their researches.

The new illuminator is more appreciated and more widely used in these countries than in Germany.

One would think that our German photographers would have perceived the great boon in the new light during the past winter days; but with short-sightedness they contented themselves with complaining at Providence and the dull times.

Harrison, in England, declares that he prefers the regular action of the Blitz-pulver light to weak, uncertain daylight. He has even introduced a system of top, side and front illumination, which give simultaneous ignition by means of electricity.

In St. Petersburg, enlargements are made with Blitz-pulver light.

Lentzky not only made a group at one sitting with Blitz-pulver, but also at once an enlarged print upon bromide paper, so that the positive was completed in less than fifteen minutes from the time of exposure.

The observations of the English are worthy of note, concerning the employment of Blitz-pulver light in connection with daylight.

Murry writes that he was commissioned to take an interior illuminated by the light from two windows, so that the portions where the light did not strike were extremely dark, notwithstanding the gleam of sunlight admitted into the room. A negative taken under these conditions would have been very harsh and violent in contrast, the portions illuminated by the strong light coming out too intense and the shadows destitute of detail.

He accordingly proceeded as follows: Placing the apparatus in the door in the side wall, he ignited two grammes of magnesium powder behind the door; the door serving as a screen for the lens. The exposure in all was two seconds and the resulting negative was excellent, without a trace of fog, the dark corners well illuminated, and the whole picture harmonious. The lens was a Steinheil aplanatic with third stop.

There are hundreds of cases where magnesium Blitz-pulver could be used to advantage, and photographs of excellent qualities obtained, of subjects hitherto impossible, but the blindness of the profession in such matters is inexcusable.

Intelligence, however, must accompany the photographer along with his other accessories.

DR. H. W. VOGEL.

ON THE HYDROQUINONE DEVELOPER.

(*From Progres Photographique.*)

HYDROQUINONE is, in my opinion, the perfection of developers, not only because of the character of the negatives it furnishes, but because of the great latitude within which it permits the operator to obtain *exactly* any desired result. If but little density is desired, the plate should be lightly developed in a fresh bath; to increase the vigor it is removed from this bath and placed in another containing an older developer, and left to itself for ten or fifteen minutes, or even more. The production of any paticular result is only a question of time. For "white and blacks" the plate should be left in a very old bath one or two hours, the time being judged by the appearance it at first assumes.

Four trays, each capable of taking four plates, will be sufficient for continuous work in the operating room; new developer to be used for rapid exposures, and older for over exposures, the latter condition being at once indicated by the grayish color taken by the plate when introduced into the developer.

I have made admirable transparencies with the developer, using a bath a month old, and allowing the plate to remain in this, undisturbed, for half an hour, although sometimes a much longer time is required. I have brought the flesh tones to the whiteness of the linen, always, however, obtaining the half tones; and, although the clothing is extremely dense, the details are always clear.

The appearance of a hydroquinone is that of a fine development with oxalate or with sulphite and pyro without carbonate. The most remarkable feature of the hydroquinone developer is that *the plates never fog.*

In my opinion, the hydroquinone will become generally adopted, and displace other developers.

The following is the formula of the developer:—Dissolve in 600 c. c. of water 150 grammes carbonate of soda. Dissolve in 300 c. c. water 75 grammes sodium sulphite. Mix the solutions, and add 10 grammes hydroquinone.

B. T. H. GERVIG.

THE THEORETICAL ASPECT OF ORTHOCHROMATIC PHOTOGRAPHY.

[Continued from page 92.]

WE have more evidence, however, which must be given. If a collodio-chloride film be dyed, exposed in the spectrum, then, before development, *be fixed*, washed, and dried, and afterwards be either coated with a collodion emulsion, and a developer be then applied, or if nitrate of silver and acidified pyrogallic acid be at once used, we have a development in the orange as well as in the violet and blue. Now in this case no bleaching action was manifest in the blue, whilst in my original experiment it was; for if the bleaching was not visible there was no effect in the orange. This would point to a slight reduction in the silver salt as well as in the cyanin, and the reason why the cyanin dye, when first bleached and then coated with emulsion, on development gave an image would be due to the *quantity* of reducing matter which came in contact with the fresh emulsion.

The action thus traced is analogous to that which I remarked in a very old experiment made some years ago. Whether I published it or not I do not now remember. It is this. If a sensitive chloride or other plate be flowed over with ferric oxalate

and exposed in the spectrum, then on development with ferrous oxalate there is a different spectrum produced to that developed when the ferric oxalate is absent. There is an increased action in the green-blue and a diminished action in the violet, to which the chloride is normally very far more sensitive when exposed in the usual manner. The explanation of this is very simple. The ferric oxalate is sensitive in the green-blue, and is there reduced to the ferrous state, which partially reduces the salt in contact with it. In the extreme violet, the ferric oxalate is less acted upon; and what is not acted upon tends to destroy the photographic action which has there taken place. If the ferric oxalate were neutral as regards the destruction of the image, we should in this case have an exact counterpart of the dye, the only difference being in the locality of the spectrum absorption of the two.

The iodide of silver was next experimented with, and this was a very interesting salt, since its spectrum ended almost abruptly near G in the violet. In the printing experiments on this salt, an observation was made which is worthy of record from another point of view. Iodide of silver, when acted upon by light, does change color in a very faint degree, but the evidence of the liberation of iodine to form subiodide is very small. The plate before exposure had a dull green color, due to the color of the iodide and that of the dye. After printing, the color in the violet and ultra-violet was a buff, and in the orange the color of the normal iodide alone was visible. The dye in contact with the iodide, acted upon by the violet rays, had absorbed the liberated iodine, and bleached it. After putting the plates in the fixing-bath, the impression made by the spectrum was shown as a white stripe where the violet end of the spectrum as far as G had acted, and a white band where the orange had acted. The ground was the blue, due to the color of the dye. This was the same in gelatine or collodion plates.

On developing a collodion plate with iodide as the sensitive salt, in which nitrate of silver was in very slight excess, the band in the orange made its appearance (see II in the figure), while, if the plate had been previously treated with a solution of bromide of potassium to convert all the minute particles of free silver into a bromide, no action was obtainable.

With a gelatine-iodide plate, to which the dye had been applied by simple soaking in a solution of water to which a very small quantity of alcohol had been added, no trace of a band in the orange could be found on development, though in printing it had bleached in that region. When the cyanin solution was made alkaline with ammonia, however, there was just a suspicion of a band. Now, the results of these experiments appear not to be in accord with the results of the chloride plates, but in reality they are confirmatory. The development of these plates was carried out by strong ferrous oxalate solution, and before full density of image could be obtained a couple of hours had to elapse, the developing action not commencing often till after five minutes. This showed that the iodide is very difficult of reduction, as, indeed, is well known, and seems to point out that the reduced dye (we know it was reduced as it bleached under prolonged printing) was not strong enough in its developing power to form the nucleus for development. In the case of the ammoniacal solution of cyanin, the development was more rapid, and beside this, it is quite possible—nay, more probable—that a very minute developing action had already commenced where the dye had been acted upon, owing to the presence of the alkali.

The silver bromide was likewise put to the same ordeal as the others. The printed spectrum was almost precisely the same as would be obtained by compounding the spectrum obtained on bromide of silver, and that on cyanine blue. This applies to gelatine or collodion plates. In every case on development, the orange band made its appearance. The reasoning applied to the chloride and iodide applies likewise to this. It should be remarked that when soluble bromide was present in any notable quantity, the action of the cyanine was almost nil, which points to the fact that the silver bromide was less easily reduced by the altered dye in its presence than when it was absent. The retarding action of the soluble bromide with the dye is analogous to its retarding action with the ordinary developer.

This applies to the erythrosin dye as well, and so this fact will not be repeated.

In these experiments carried out with cyanine and chloride, bromide and iodide, we have the bromide more acted upon in the green than the chloride, and very much more the iodide, which agrees with the order of reduction which was given above.

Perhaps here I had better call attention to the very important item in these experiments which I have described. It will be seen that in order to render the action of cyanine visible, it is not necessary to dye the film of a gelatine plate. It is only necessary to have two films in contact, one containing dye alone, and the other the sensitive salt, and to expose through the dyed film. This is what might be expected, however, as development commences at the surface. I may say that by placing a dried film of dyed collodion in contact with a gelatine film under great pressure the same action is manifest, though in a minor degree. This is a somewhat remarkable result, and applies not only to cyanin but to erythrosin and all the dyes I have ever tried which give sensitiveness to a plate; and to this may be added substances which increase the general sensitiveness of a plate. Thus collodion or resinous varnishes containing dyes, and even an alcoholic solution of the dye itself, will give the necessary orthochromatic properties, and is a very simple way of proceeding. Plates thus need not be prepared in advance, but are ready for immediate use on application of the varnish or dye. The dyed coating may be rendered alkaline by passing ammonia through the alcoholic solvent, or the film may first be rinsed with ammonia in water and dried, or it may be flooded with an alcoholic solution of ammonia and then the second film applied. The action is then more rapid. This method of applying coloring matters is very advantageous, since it enables those to be used, such as chlorophyll, which cannot be employed in an aqueous solution, but which can well be employed in an alcoholic solution.

We now come to erythrosin,* and this is a different type of dye, in that it will combine with silver nitrate, and probably with silver bromide. When a plate is dyed with simple erythrosin, the resulting body may be a lake, together with a compound of silver, be it held in situ in gelatine or in collodion. A film may be more or less dyed, and when dried and again wetted, no ordinary amount of soaking in water or in alcohol will eliminate all the dye, and, indeed, very little of it. Remove the salt of silver in the fixing-bath, and the whole of the color may be speedily washed

*It should here be stated that the series of experiments was intended to be made with eosin, but owing to an initial mistake erythrosin was first employed, and so the rest of the experiments were made with it. For some purpose eosin when applied to the bromide would have been more instructive, since it is a bromide of fluorescin which might have formed a true double compound with the silver bromide, but it is by no means improbable that erythrosin does the same.

out, leaving no trace behind it. The inorganic body having been removed, there is nothing to hold the dye. Eder proved that, however, thorough the washing of dyed bromide emulsion might be after separating it from the gelatine, still a certain quantity of dye always remained behind, and sufficient to give the yellow sensitiveness in the case of the dye which he was examining. It is possible that in this irremovable color we have the quantity of dye which combines with the silver salt. (That it does not combine with the gelatine is shown by the fact that if a dyed film containing a solid silver salt be fixed, the whole of the dye may be washed out.)

If the whole of the dye be present, as in a lake, its molecular contact with the silver salt is sufficient to account for the orthochromatic action, as in the case of cyanin.

Placing a bromide film stained with erythrosin in the spectrum, and *printing* on it, we have a curious result. When a gelatine plate is used, the spectrum prints in the violet-blue, as usual. But in the green, in addition, there is an increased darkening where the absorption bands of erythrosin are extant.

When dyed plates were *developed* we got the image of the spectrum as has so often been described before.' If a gelatine plate was *coated with collodion stained with erythrosin*, precisely the same action was manifest. When the collodion film was removed after exposure the action was still visible and indeed marked. Even when the film was treated with sulphurous acid the band in the green was still persistent.

With a chloride plate (collodion or gelatine), when the plate is dyed we have a darkening action in the blue and a bleaching or rather yellowing action in the green, where the erythrosin absorption bands are found. This refers to the printing out action. The chloride in collodion is not sensitive to this part of the spectrum. When the dyed chloride plate is exposed in the spectrum an image is developed in both the violet and the green; in the case of the collodio-chloride, and in the gelatino-chloride the blue and violet are acted upon and also the band in the green.

Coating a gelatino-chloride plate with collodion dyed with erythrosin we get the same action exactly, but if it be removed before development, we get a slightly less intense band in the green.

If, however, the plate be coated with collodion and the dye altered by means of sulphuric acid in alcohol, no action in the green is seen at all, although a very prolonged exposure was given to this part of the spectrum with white iight, which had been first absorbed by passage through a cell containing chromate of potash. The image in the violet developed out strongly, as usual, showing that the sulphurous acid had not destroyed the silver image.

With the iodide we have a very curious action. There is an apparent yellowing of the dye in the green band, which may be the commencement of bleaching, or the reduction to sub-iodide of the salt beneath the former is most probable, if the image which is developed be taken into account. On a gelatine plate the spectrum does pretty much the same.

On developing, however, it appears that in the green there is not the faintest trace of a band on a gelatino-iodide plate. There is a slight one, however, on a collodion plate in which the silver nitrate is slightly in excess. This difference in behaviour is due to the fact that in the latter the silver nitrate has combined with the

dye. The same reason for the non-appearance of the band with the iodide given when cyanin was the dye used seems tn hold in this case. When the dye is used with ammonia, however, we do get a slight indication of a band. This is also probably due to the cause pointed out when dealing with the action of cyanin on silver iodide.

These experiments show that the order of action is the (1) *bromide*, (2) *chloride*, (3) *iodide*, which is the same as that with cyanin, and supports—may not I say proves—the theory.

A few other experiments which I undertook I will just indicate. It was my wish to see if the gelatine or collodion had anything to do with the results. To test for this, I used polished silver plates, such as are used for daguerreotype-plates. One I immersed in bromine water, and after the surface had been well washed and dried, treated it with a solution of erythrosin. The result was that on development with ferrous oxalate, the band in green appeared together with the darkening in the blue and violet; in fact, it behaved like a collodion plate. With a similar plate treated with cyanin, there was the band in the orange visible, but when the cyanin was first removed, the band was not observable. Similar experiments were carried out with chlorinzed plates with like results. Another experiment suggested itself—viz., to treat a daguerreotype-plate iodized in the usual way with a dye, and then after removing the dye to develop with mercury vapour. The following are the results. The plate was exposed for twenty minutes to the spectrum formed by white light which had passed through a cell containing chromate of potash, and then one minute to the whole of the spectrum. This gave no band whatever in the green. A plate treated with bromine and similarly developed, gave indications of a band in the green.

Other experiments were carried out also with a mixture of cyanin and erythrosin, and cyanin and eosin.*

I think, then, the experiments tend to prove that the nucleus theory is not an impossible or improbable one. For my own part, I may say that I am perfectly satisfied that it is a very safe explanation of the whole of the phenomena met with in the action of dyes. The theory of optical sensitizers, as I understand it, is different, and it is one from which I have always, and quite recently, expressed my dissent. The term is misleading, I would suggest. That there is a secondary action on the silver compound by the reduced dye is beyond dispute, but this is not caused by light, but by the reducing power of the altered dye; in fact, this last will do its work equally effectively if altered by chemical means.

Whatever may be the opinion of the theory, one thing this set of experiments has led to—viz., the method of making a plate sensitive to rays to which it was before insensitive (or, at all events, not very sensitive) by means of a second film of dyed material. This is valuable in that the colour sensitizing may be effected in a very few minutes before the plate is required for use. I have developed plates by the alkaline method, and by ferrous oxalate when thus treated, and I have got good

* I may point out that I am under the impression I was some time the first to point out the benefits of this mixture. On Aug. 5, 1884, I wrote to the *Photographic News*: "An emulsion, whether it be collodion or gelatine, can be rendered sensitive to red, yellow, and green, by mixing it with a trace of cyanin and a rather stronger proportion of eosin." I quote this, as this mixture has been rediscovered in Germany after that date. Then I went on to describe how the plates should be dyed. Further, in the same communication I showed how to add eosin of silver to a gelatine emulsion. I make thisnote here, as the mixture has been subsequently recommended.

results with both. Very thin varnish is perhaps the easiest method of applying the dye to the surface, as it is easily removed. This method requires working at a little to give the best results in development, and this I leave to others.

CAPT. W. DEW. ABNEY.

JOINT EXHIBITION AWARDS.

THE following is the list of awards at the Second Annual Joint Exhibition held in Boston, May 7th to 12th:

Class 1. Landscapes over 6½ x 8½ inches. Prof. Henry A. Rowland, Johns Hopkins University, Baltimore, N. Y. Society.

Class 2. Landscapes 6½ x 8½ inches and under. Frank M. Sutcliffe, Whitby, Yorkshire, England: John Patterson Gibson, Hexham, England.

Class 3. Marine Views—Surf. Horace A. Latimer, Boston, Mass., Boston Club.

Class 4. Marine Views—Sail. No diploma awarded.

Class 5. Figure Compositions over 6½ x 8½ inches. No diploma awarded.

Class 6. Figure Compositions 6½ x 8½ inches and under. Geo. B. Wood, 5502 Germantown Avenue, Philadelphia, Philadelphia Society.

Class 7. Portraits. No diploma awarded.

Class 8. Animals. Frank M. Sutcliffe and Geo. B. Wood.

Class 9. Still Life. No diploma awarded.

Class 10. Architecture. No diploma awarded.

Class 11. Interiors. Miss Annie L. Richards, Boston, Mass.

Class 12. Enlargements. No diploma awarded.

Class 13. Instantaneous Effects. David Pepper, 1827 Spruce Street, Philadelphia, Philadelphia Society.

Class 14. Transparencies. Prof. Henry A. Rowland.

Class 15. Set of six lantern slides. Negatives and slides to be made by exhibitor. Horace A. Latimer.

Class 16. Set of twelve Pictures by a foreign exhibitor, or taken in a foreign country. John C. Lea, 145 Cedar Street, Roxbury, Mass., Boston Club.

Class 17. Pictures by any new process not before publicly exhibited. Henry Harrison Suplee, 339 West Chelten Avenue, Germantown, Philadelphia, Philadelphia Society. Instantaneous Pictures at night. Blitz-Pulver.

Class 18. Pictures not otherwise classified; Micro-photographs, Sculpture, etc., etc. Dr. R. R. Andrews, Cambridge, Mass., Boston Club.

Special Ladies' Class. Miss Catharine Barnes, Albany, N. Y.

Number of Frames, 320.

Number of Prints, 1100.

Sets of Slides, 18.

Transparencies, 18.

The exhibition was a fine one, the standard of pictures being high.

MR. FRED. E. IVES has succeeded in making an ordinary gelatine plate sensitive from the blue to the extreme orange of the spectrum without diminishing the original sensitiveness of the plate. The negative is developed in almost total darkness.

MAY BARGAIN LIST.

Accessories:

1—8x10 Old Style Perfect Camera Stand 6 00
1—Pharoah Position Chair, crimson terry 6 00
1—20-in Entrekin Eureka Burnisher 30 00
1—Seavey Swiss Cottage Accessory 12 00
2—8x8 Interior Backgrounds, each 6 00
1—8x10 Hough's Exterior Ground, new, light left, ... 11 00
1—8x10 Exterior Ground, good condition, ... 10 00
2—Spencer Head-rests 11 00
British Journal Almanacs for 1878 20
Photo Mosaics for 1883, ... 20
1—8x10 Plain painted ground . 4 00
1—Knickerbocker stand, with 14x17 top 12 00
1—8x10 Osborne's interior background, new, light left . . . 20 00
1—4x8 Osborne's side slip . . . 7 50
1—Osborne stile, new 4 50
Pearl leads, the best retouching point in the market, each . 15
Interchangeable View Albums, 7x10, for 5x8 views, with removable leaves fastened by cord, each 1 35
Job lot fine cab. Plush Frames, each 60
8x10 Job Lot Picture frames; write for particulars.

Desiring to reduce our stock, we will sell for a short time.

	PER DOZ.
5x7 Woodbury Dry Plates . . .	77
5x3 " " . . .	80
4¼x6½ " " . . .	65
6½x8½ Triumph " . . .	85
5x7 " " . . .	55
4¼x6½ " " . . .	45
5x8 Neidhardt " . . .	65
4x5 Bridle " . . .	35

Camera Boxes:

1—4x5 Scovill Camera, lens and tripod 7 00
1—4x5 Scovill '76 Outfit with German view lens 15 00
1—6½x8½ Rochester Optical Co. Ideal Camera, new 22 00
1—4x5 Anthony Novalet Camera, lens and tripod, new . . . 16 00
1—5x7 Victoria Ferrotype Camera and holder 9 00
1—11x14 Scovill View Camera with double dry plate holder, 35 00
1—8 x 10 American Optical Co.'s Royal Camera, double swing and carriage movement, . 25 00
1—4x5 Bijou Camera, and two holders, ... 8 00
1—4x5 Novalet Camera and holder, new 10 50
1—5x7 Flammang revolving back camera, three holders, extension tripod, Darlot wide angle lens and canvas case . . . 50 00
1—4x5 Photo-Microscopic enlarging outfit, ... 14 00
1—11x14 Blair reversible back, extension front view, box and 3 holders, ... 40 00
1—5x8 Tourist Outfit, including 5x8 Tourist Camera Box, 2 Daisy Plate Holders, 1 Extension Tripod, and 1 Canvas Carrying Case, very little used. Price, new, $40.50, will sell for 30 00
1—4x5 '76 outfit 15 00
1—10x12 Cone View Camera, Double Swing, new 52 80
1—11x14 New Haven Reversible Back Camera, Double Swing, new 44 00
1—14x17 New Haven Acme Portrait Camera, Single Swing, new 46 00
1—4x4 Standard Portrait Camera wet holder, new 14 75
1—4x5 Flammang revolving back Camera, new, ... 25 00
1—4¼x5½ No. 202 A. Scovill Outfit 20 50
1—6½x8½ View Camera and Lens 12 00
1—5x8 Wet Plate Stereo Camera, 3 holders, case and tripod . 25 00
1—6½x8½ American Optical Co. first qual. View Camera . . 23 00
1—4¼x5½ Ex. qual. Portrait Camera 17 50
1—5x8 American Optical Co., Stereo Camera 25 00
1—6½x8½ Standard Portrait Camera, with holder 13 60
1—5x8 Blair View Camera, single swing 17 00

Lenses:

1—½ size Harrison Portrait lens, cut for stops 10 00
1—4x4 Harrison Portrait Lens, cut for stops 20 00
1—½ size Voigtlander Lens . . 15 00
1—8x10 Morrison Peerless Portrait Lens, ... 40 00
1—Matched pair German Stereoscopic Lenses, in good order . 15 00
1—5x8 Dallmeyer View Lens . . 15 00
1—Woodward Condensing Lens 10 00
1—4x4 Darlot Globe Lens . . . 25 00
1—4x4 " " " . . . 20 00
1—⅓ size L. W. Krantz Portrait Lens 12 50
1—¼ size portrait lens 3 00
1—½ size C. C. Harrison portrait lens 8 00
1—½ size Darlot quick acting Portrait Lens, central stops . 18 00
1—No. 6, 17x20 Darlot wide-angle Hemispherical Lens 38 00
1—Extra 4x4 Chapman Portrait Lens 20 00
1—8x10 E. A. View Lens . . . 5 00
1—Ross View Lens 5 00
1—H. Fitz Double View Lens, revolving stops 8 00
1—8 x 10 Voigtlander Portrait Lens 80 50
1—4x4 Dallmeyer Group Lens . 50 00
1—4x4 Walzl Portrait Lens . . 20 00

WANTED—Permanent situation as retoucher—a first-class hand.
E. URBAN, 430 N. 4th St., Phila.

1—$\frac{1}{01}$ Beck Microscopic Objective, nearly new, ... 20 00

TO meet the frequent inquiries for a cheap *rectilinear* lens, we have put on the market the "Orthoscope." These are light, compact and quick acting, so that they can be used for instantaneous work. Sizes, 4x5, $10.00; 5x8, $15.00.
THOS. H. MCCOLLIN & CO.,
635 Arch Street, Phila.

FOR SALE—A well-equipped and only gallery in a growing town of 6000 inhabitants. No old traps, everything new—good chance for young man with small capital. Address with stamp, Box 244, Middletown, Pa.

FOR SALE—Photograph Gallery near Philadelphia, established for one year, or will take partner with some capital to push business. Address P., care of Thos. H. McCollin & Co., 635 Arch St., Phila.

FOR SALE—Seven-room frame house nearly new, with bay window, large garret and cellar, 40 x 50 photograph gallery, on fertile lot with good variety of fruit; in a town of 1,000 inhabitants, within one minute from depot, express and freight offices. For further particulars address J. K. M., care of
THOS. H. MCCOLLIN & CO.

CRUSHED Hyposulphite of Soda in neat pasteboard boxes—8 cents per pound.

FOR SALE — A gallery in Atlantic City; first-class condition, conveniently arranged, good location. Also, tent (new) and outfit. Address,
S. H. COPE,
Box 409. Norristown, Pa.

FOR SALE—A long-established gallery, with complete outfit for indoor or outdoor work, will be sold at bargain. Poor health the reason for selling. Apply to 635 Arch St., or J. A. M., 715 French St., Wilmington, Del.

FOR SALE—In perfect condition (having been used only a few times) a No. 2 A Dallmeyer lens. This lens is used by all the best photographers for rapid portrait work, having a flat field, great depth of focus and wide opening. List price, $148.00; will be sold for spot cash, $90.00.
THOS. H. MCCOLLIN & CO.,
635 Arch St., Philadelphia.

HINTS TO AMATEURS—A valuable book of instructions, mailed on receipt of two two-cent stamps.

TO AMATEUR PHOTOGRAPHERS—Send three two-cent stamps for McCollin's Photographic Note Book, for keeping a record of exposures.